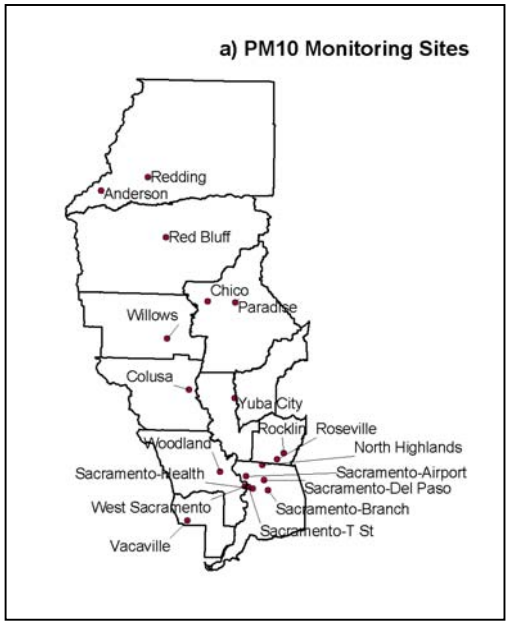
I. Sacramento Valley Air Basin

The Sacramento Valley Air Basin is comprised of nine air districts: the Shasta County AQMD, that consists of Shasta County; the Tehama County APCD, that consists of Tehama County; the Glenn County APCD, that consists of Glenn County; the Butte County APCD, that consists of Butte County; the Colusa County APCD, that consists of Colusa County; the Feather River AQMD that includes Sutter and Yuba Counties; the western portion of the Placer County APCD, that consists of the western portion of Placer County; the Yolo-Solano AQMD, that includes Yolo County and the eastern portion of Solano County; and the Sacramento Metro AQMD, that consists of Sacramento County.

The entire air basin is currently designated as nonattainment for the State 24-hour and the annual PM10 standards. The Butte County and Sacramento Metro air districts, as well as the western portion of the Placer County APCD are designated as nonattainment for the State PM2.5 annual standard, while the remainder of the air basin is designated as unclassified - available data are insufficient to support designation as attainment or nonattainment. The Sacramento Metro AQMD is also designated as nonattainment for the national PM10 standards. However, although the area has not been officially redesignated, it has not exceeded these standards for many years.

Figure I-1 shows the PM10 (a) and PM2.5 (b) monitoring sites throughout the Sacramento Valley Air Basin.

Figure I-1. PM10 and PM2.5 Monitoring Sites throughout the Air Basin.



Shasta County AQMD

Table I-1 provides information on the yearly variations in the highest PM10 and PM2.5 concentrations recorded across the Shasta County AQMD in 2001 through 2003. We estimate that during this period, particulate levels exceeded the State 24-hour PM10 standard of 50 $\mu g/m^3$ twenty-four times, and consistently exceeded the State annual standard of 20 $\mu g/m^3$. In 2001 and 2002, annual average PM2.5 concentrations remained below the State PM2.5 standard of 12 $\mu g/m^3$, however data are insufficient to determine if this was also the case in 2002.

Table I-1. PM10 and PM2.5 Air Quality in the Shasta County AQMD.

Year	PM10 (ug/m^3)			PM2.5 (ug/m^3)	
	Calculated Days over State Std.	Max 24-hour (Std.=50)	Max Annual Average (Std.=20)*	Max 24-hour	Max Annual Average (Std.=12)
2001	6	71**	24	49	9
2002	6	59	21	40	Incomplete Data
2003	12	52	22	34	8

* The maximum 24-hour PM2.5 values are provided for information only.
** This value is excluded for determining attainment status. See text.

Table I-2 provides the 24-hour and annual designation values for the State standards for the 2001-2003 period. Designation values represent the highest 24-hour PM10 concentration measured during the three year period, after concentrations measured during highly irregular and infrequent events have been excluded, and the highest estimated PM10 and PM2.5 annual average in the same period. For example, the maximum 24-hour PM10 concentration in 2001 shown in Table I-1 was identified as an extreme concentration event and was excluded in determining the designation values shown in Table I-2. The designation values are determined for each site, and the highest site is used for determining an area's designation. Based on these data, the Shasta County APCD currently is nonattainment for both the State 24-hour and annual average PM10 standards. The District is unclassified for the State annual PM2.5 standard – available data are insufficient to support designation as attainment or nonattainment.

Table I-2. Air District Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Designation Value	59	24	Incomplete Data

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Table I-3 provides designation values for each monitoring site in the air district to provide further information on the geographic distribution of concentrations. The data show that both PM10 monitors exceeded the State 24-hour and annual PM10 standards. Although the data are not complete for all years, PM2.5 annual average concentrations at Redding were below the State annual PM2.5 standard.

Table I-3. Monitoring Site Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

Site	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Anderson	58	24	No Monitor
Redding	59	21	9

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Figure I-2. Seasonal Variation in PM10 and PM2.5 Concentrations.

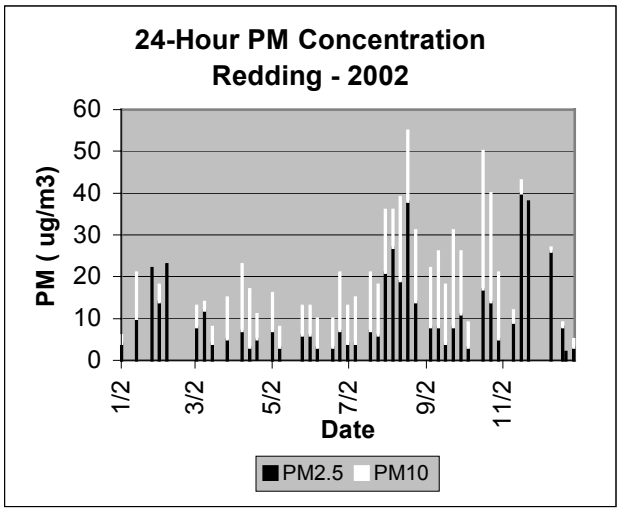


Figure I-2 illustrates the variation in PM10 and PM2.5 levels throughout 2002 at Redding. The total height of the bars represents PM10 concentrations, while the height of the black portion of the bars represents the PM2.5 fraction. Higher PM10 concentrations occurred during the summer, fall, and winter. The coarse fraction (particles between PM2.5 and PM10 in size) was largest during the early fall. The coarse fraction is primarily due to activities that resuspend dust, such as emissions from paved and unpaved roads and construction.

In contrast, the highest PM2.5 concentrations occur during the late fall and winter. The colder, more stagnant conditions during this time of the year are conducive to the buildup of PM, including the formation of secondary ammonium nitrate. In addition, increased activity from residential wood combustion may also occur. In August, wildfires were a contributor to the higher PM2.5 levels.

Based on 2000-2003 data, we estimate that the PM2.5 fraction accounts for 59 percent of PM10 during the fall and 67 percent during the winter. On an annual basis, we estimate that PM2.5 comprises 50 percent of the PM10 levels.

Although no chemical composition data is available, based on data from sites elsewhere in the air basin, we estimate that secondary ammonium nitrate and sulfate comprise approximately 30 percent of PM2.5.

Tehama County APCD

Table I-4 provides information on the yearly variations in the highest PM10 and PM2.5 concentrations recorded across the Tehama County APCD in 2001 through 2003. During this period, particulate levels consistently exceeded the State 24-hour PM10 standard of 50 $\mu g/m^3$. Although data are insufficient to determine the calculated days exceeding the State 24-hour PM10 standard, from at least 48 out of the 60 scheduled days with measured PM concentrations in each year, three days in 2001, seven days in 2002, and one day in 2003 exceeded the standard. Data were insufficient to determine whether the annual PM10 standard was also exceeded. There is no PM2.5 monitor in the air district.

Table I-4. PM10 and PM2.5 Air Quality in the Tehama County APCD.

Year	PM10 (ug/m^3)			PM2.5 (ug/m^3)	
	Calculated Days over State Std.	Max 24-hour (Std.=50)	Max Annual Average (Std.=20)	Max 24-hour	Max Annual Average (Std.=12)
2001	Incomplete Data	73	Incomplete Data	No Monitor	
2002	Incomplete Data	71	Incomplete Data		
2003	Incomplete Data	58	Incomplete Data		

Table I-5 provides the 24-hour and annual designation values for the State standards for the 2001-2003 period. Designation values represent the highest 24-hour PM10 concentration measured during the three year period, after concentrations measured during highly irregular and infrequent events have been excluded, and the highest estimated PM10 and PM2.5 annual average in the same period. The designation values are determined for each site, and the highest site is used for determining an area's designation. Based on these data, the Tehama County APCD currently is nonattainment for the State 24-hour PM10 standard. The District is unclassified for the State annual PM2.5 standard – available data are insufficient to support designation as attainment or nonattainment.

Table I-5. Air District Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Designation Value	73	Incomplete Data	No Monitor

*Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Table I-6 provides designation values for each monitoring site in the air district to provide further information on the geographic distribution of concentrations. Only a single monitoring site located at Red Bluff is operated in the District.

Table I-6. Monitoring Site Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

Site	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Red Bluff	73	Incomplete Data	No Monitor

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Figure I-3. Seasonal Variation in PM10 Concentrations.

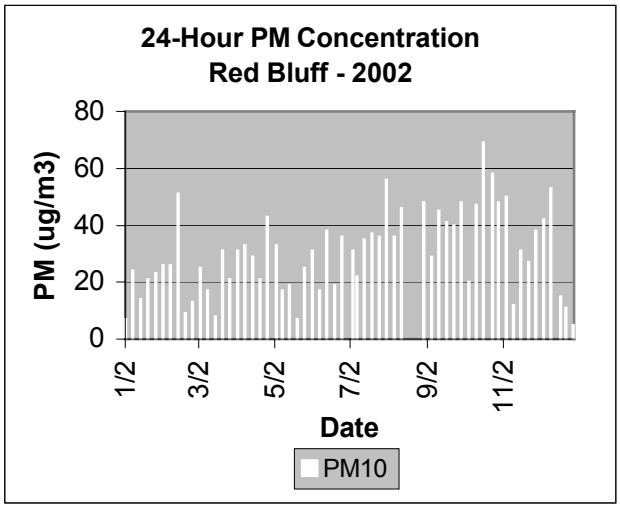


Figure I-3 illustrates the variation in PM10 levels throughout 2002 at Red Bluff. PM10 concentrations were slightly higher during the fall and winter. Although no PM2.5 monitor is operated in the District, based on information from other sites in the air basin, we estimate that on an annual average basis, PM2.5 contributes approximately 40 to 50 percent to PM10. In addition, although no chemical composition data is available, based on information from other sites in the air basin, we estimate that secondary ammonium nitrate and sulfate comprises approximately 30 percent of PM2.5.

Glenn County APCD

Table I-7 provides information on the yearly variations in the highest PM10 and PM2.5 concentrations recorded across the Glenn County APCD in 2001 through 2003. We estimate that during this period, particulate levels exceeded the State 24-hour PM10 standard of 50 $\mu g/m^3$ at least fifty-nine times, and in 2002, exceeded the State annual standard of 20 $\mu g/m^3$. There is no PM2.5 monitor in the air district.

Table I-7. PM10 and PM2.5 Air Quality in the Glenn County APCD.

Year	PM10 (ug/m^3)			PM2.5 (ug/m^3)	
	Calculated Days over State Std.	Max 24-hour (Std.=50)	Max Annual Average (Std.=20)	Max 24-hour	Max Annual Average (Std.=12)
2001	Incomplete Data	68	Incomplete Data	No Monitor	
2002	41	80	29		
2003	18	61	20		

Table I-8 provides the 24-hour and annual designation values for the State standards for the 2001-2003 period. Designation values represent the highest 24-hour PM10 concentration measured during the three year period, after concentrations measured during highly irregular and infrequent events have been excluded, and the highest estimated PM10 and PM2.5 annual average in the same period. The designation values are determined for each site, and the highest site is used for determining an area's designation. Based on these data, the Glenn County APCD currently is nonattainment for both the State 24-hour and annual average PM10 standards. The District is unclassified for the State annual PM2.5 standard – available data are insufficient to support designation as attainment or nonattainment.

Table I-8. Air District Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Designation Value	80	29	No Monitor

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Table I-9 provides designation values for each monitoring site in the air district to provide further information on the geographic distribution of concentrations. Only a single monitor located at Willows is operated in the District.

Table I-9. Monitoring Site Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

Site	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Willows	80	29	No Monitor

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Figure I-4. Seasonal Variation in PM10 Concentrations.

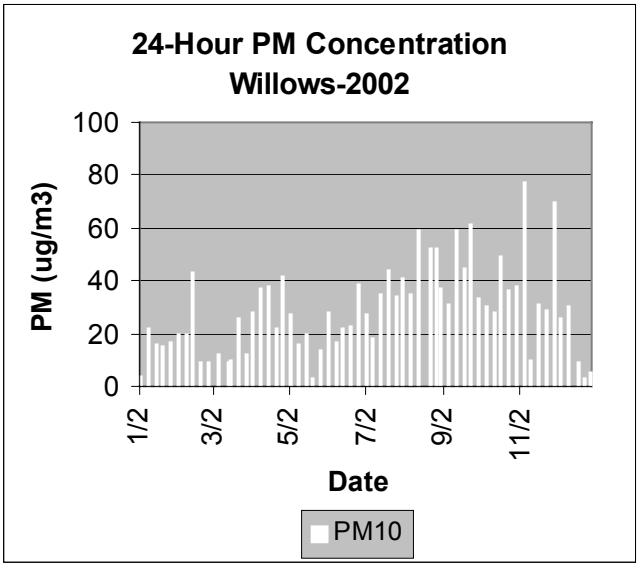


Figure I-4 illustrates the variation in PM10 levels throughout 2002 at Willows. Higher PM10 concentrations occurred during the late summer through early winter. Although no PM2.5 monitor is operated in the District, based on information from other sites in the air basin, we estimate that on an annual average basis, PM2.5 contributes approximately 40 to 50 percent to PM10. In addition, although no chemical composition data is available, based on information from other sites in the air basin, we estimate that secondary ammonium nitrate and sulfate comprises approximately 30 percent of PM2.5.

Butte County AQMD

Table I-10 provides information on the yearly variations in the highest PM10 and PM2.5 concentrations recorded across the Butte County APCD in 2001 through 2003. We estimate that during this period, particulate levels exceeded the State 24-hour PM10 standard of 50 $\mu g/m^3$ seventy four times, and consistently exceeded the State annual PM10 standard of 20 $\mu g/m^3$. In 2002 and 2003, particulate levels exceeded the State PM2.5 standard of 12 $\mu g/m^3$.

Table I-10. PM10 and PM2.5 Air Quality in the Butte County AQMD.

Year	PM10 (ug/m^3)			PM2.5 (ug/m^3)	
	Calculated Days over State Std.	Max 24-hour (Std.=50)	Max Annual Average (Std.=20)	Max 24-hour*	Max Annual Average (Std.=12)
2001	31	112**	30	65	Incomplete Data
2002	37	96	29	96	15
2003	6	54	22	67	16

* The maximum 24-hour PM2.5 values are provided for information only.
** This value is excluded for determining attainment status. See text.

Table I-11 provides the 24-hour and annual designation values for the State standards for the 2001-2003 period. Designation values represent the highest 24-hour PM10 concentration measured during the three year period, after concentrations measured during highly irregular and infrequent events have been excluded, and the highest estimated PM10 and PM2.5 annual average in the same period. For example, the maximum 24-hour PM10 concentration in 2001 shown in Table I-10 was identified as an extreme concentration event and was excluded in determining the designation values shown in Table I-11. The designation values are determined for each site, and the highest site is used for determining an area's designation. Based on these data, the Butte County APCD currently is nonattainment for both the State 24-hour and annual average PM10 standards. The District is also nonattainment for the State annual PM2.5 standard.

Table I-11. Air District Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Designation Value	96	30	16

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Table I-12 provides designation values for each monitoring site in the air district to provide further information on the geographic distribution of concentrations. The data show that particulate levels at both PM10 monitors exceeded the State 24-hour standard, while Chico also exceeded the annual standard. PM2.5 concentrations at Chico and Gridley also exceeded the State annual PM2.5 standard.

Table I-12. Monitoring Site Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

Site	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Chico	96	30	16
Gridley	No Monitor	No Monitor	15
Paradise	96	Incomplete Data	No Monitor

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Figure I-5 illustrates the variation in PM10 and PM2.5 levels throughout 2002 at Chico, while Figure I-6 shows the variation in PM2.5 levels at Gridley. The total height of the bars represents PM10 concentrations, while the height of the black portion of the bars represents the PM2.5 fraction. At Chico, PM10 and PM2.5 concentrations are highest during the fall and winter, and at Gridley PM2.5 concentrations are highest during the winter. The colder, more stagnant conditions during this time of the year are conducive to the buildup of PM2.5, including the formation of secondary ammonium nitrate. In addition, increased activity from residential wood combustion may also occur. Wildfires may have led to a peak in PM2.5 concentrations in August of 2002.

Figure I-5. Seasonal Variation in PM10 and PM2.5 Concentrations.

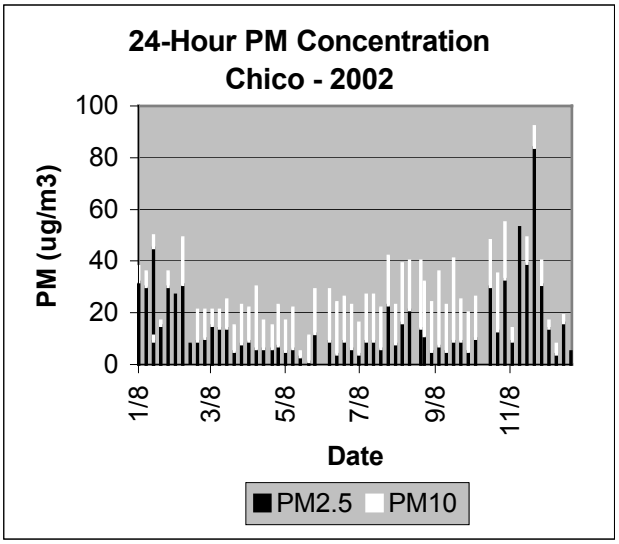
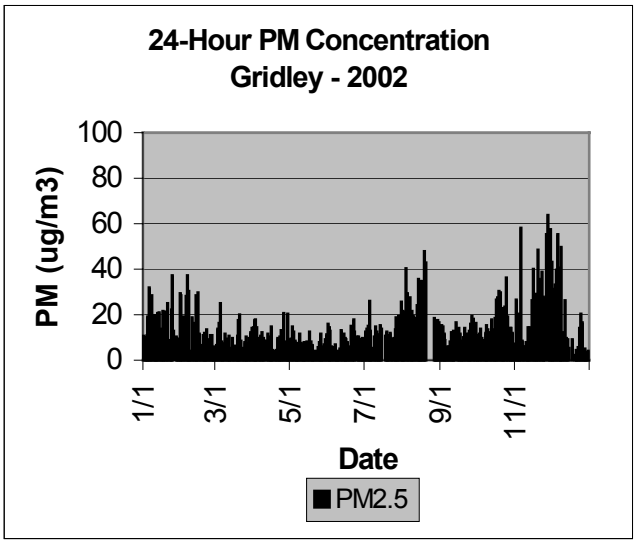


Figure I-6. Seasonal Variation in PM2.5 Concentrations.



Based on 2000-2003 data, we estimate that the PM2.5 fraction accounts for approximately 67 percent of ambient PM10 levels during the fall and winter. On an annual average basis, we estimate that PM2.5 comprises 50 percent of the PM10 levels.

Figure I-7 presents the average hourly variation for the days within the year with the highest PM2.5 concentrations at Chico (a) and at Gridley (b). At Chico, the highest PM2.5 concentrations occurred from 7 p.m. to 1 a.m., while at Gridley PM2.5 levels in general peaked from 5 to 9 p.m. Peak evening concentrations generally reflect the influence of lowering inversion heights that trap pollutants close to the surface, as well as increased activity from evening commute traffic and residential wood combustion during winter months. During Thanksgiving Day (11/28) at Gridley, the highest PM2.5 levels were recorded across a longer portion of the day, from 11 a.m. through 11 p.m., possibly reflecting the impacts of holiday residential wood burning and more broadly distributed traffic patterns.

Figure I-7. Hourly Variation in PM2.5 Concentrations.

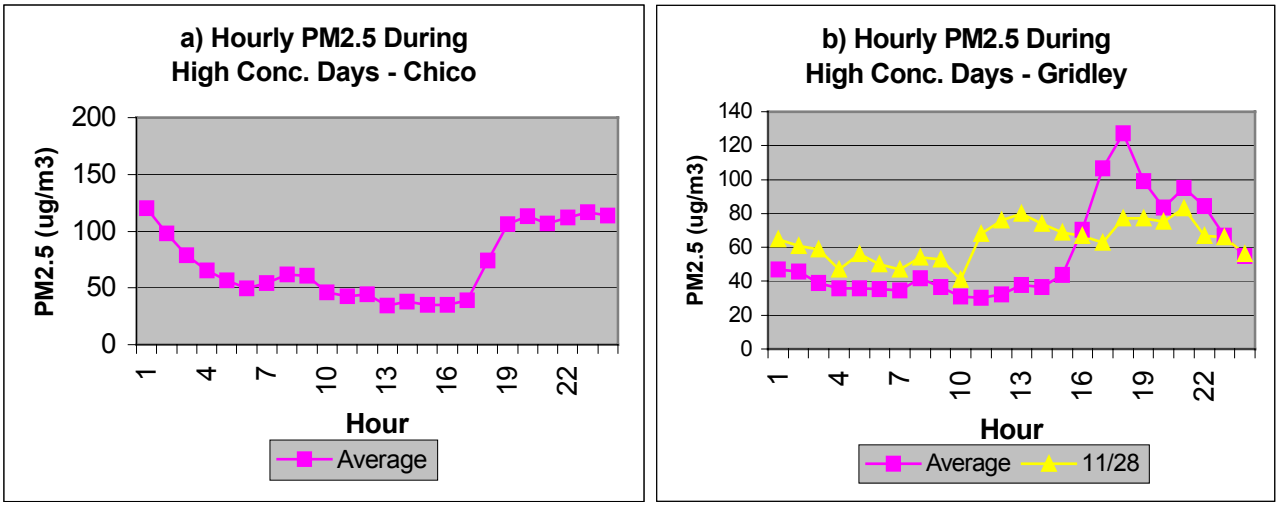
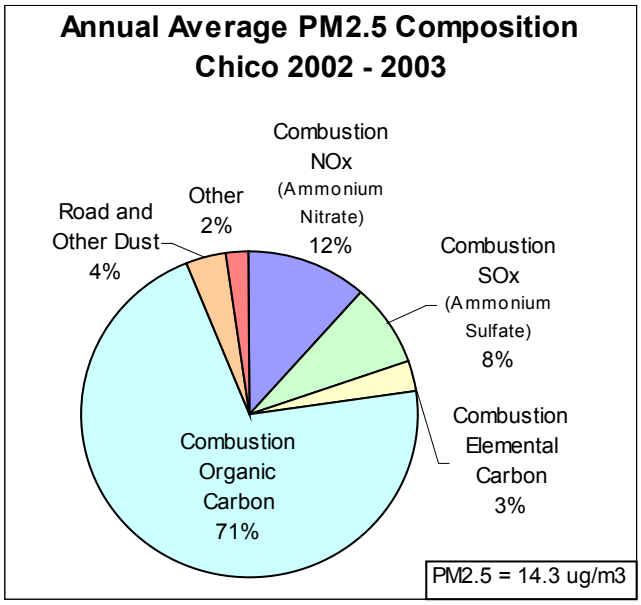


Figure I-8. Chemical Composition of Annual Average PM2.5 and Link to Emission Source Type.



Data for Figure I-8 are from analysis of ambient PM2.5 data collected at Chico from the State's PM2.5 speciation network. Chemical components have been associated with possible emission sources based on emission inventory information. The data in Figure I-8 show that on an annual average basis organic carbon is the major contributor to PM2.5 (71 percent). The majority of organic carbon is suspected to be due to directly emitted carbon from combustion sources. Key sources include vehicles, residential wood combustion, agricultural and prescribed burning, and stationary combustion sources. However, a fraction may be due to secondary organic aerosol formation from anthropogenic and biogenic VOC emissions.

Ammonium nitrate and ammonium sulfate - formed in the atmosphere from chemical reactions of NOx and SOx from mobile and stationary source combustion sources - also contribute significantly to ambient PM2.5 (approximately 20 percent). Dust from roads and other dust producing activities and elemental carbon from combustion processes contribute to a lesser extent.

Figure I-9 illustrates the quarterly variation in PM2.5 levels and in its chemical components expressed in $\mu g/m^3$ (a) and as percent of PM2.5 (b) at Chico. As in the previous figures, chemical components have been associated with possible emission sources based on emission inventory information. On average, during the 2002-2003 period, higher PM2.5 concentrations were recorded during the fall and winter. The PM2.5 chemical composition is very similar throughout the year, with organic carbon the principal contributor (approximately 70 percent). During the fall and winter, the ammonium nitrate fraction of PM2.5 is higher than during the spring and summer, while ammonium sulfate and dust contribute slightly more to ambient PM2.5 during the spring and summer. Sunnier, warmer conditions during the summer are more conducive to ammonium sulfate formation, and may also increase secondary organic aerosol formation.

Figure I-9. Chemical Composition of Average Quarterly PM2.5 and Link to Emission Source Type.

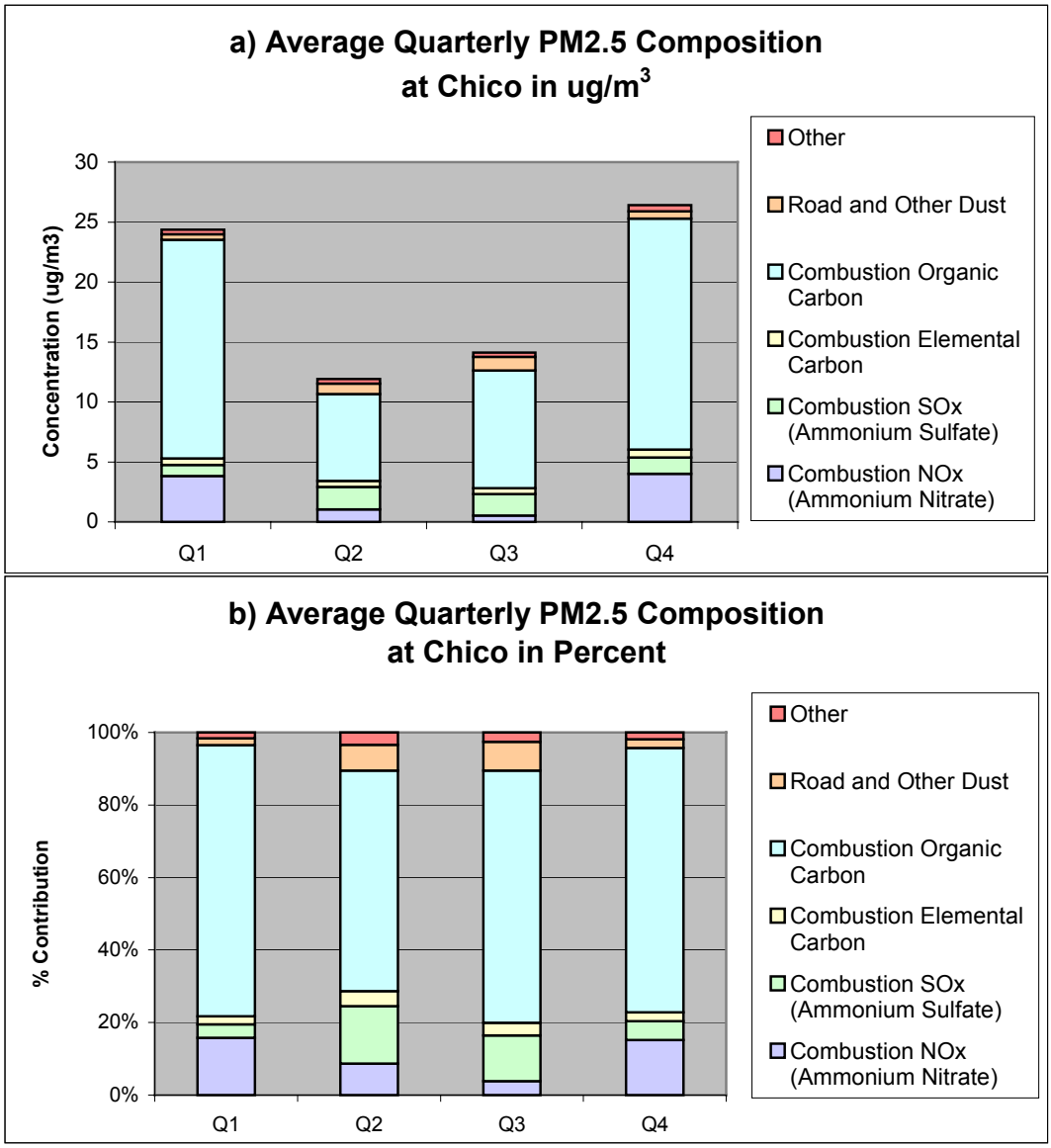


Figure I-10. Chemical Composition of PM2.5 on a High Concentration Day and Link to Emission Source Type.

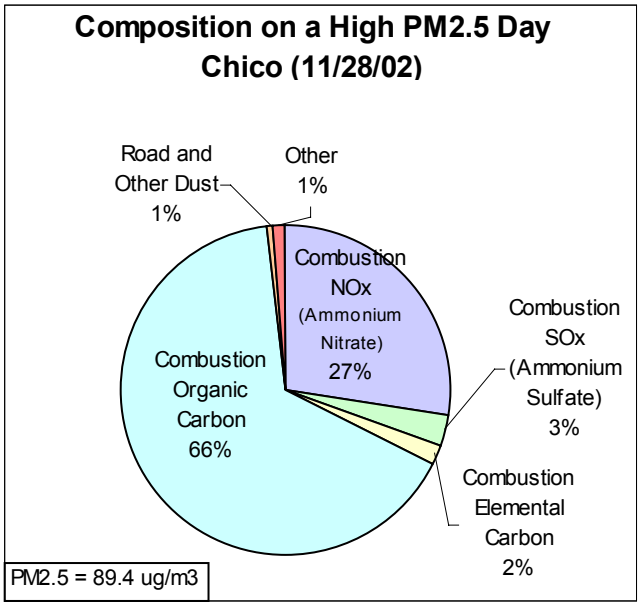


Figure I-10 shows the chemical composition on a high PM2.5 concentration day. On this day, the ammonium nitrate contribution to PM2.5 increased significantly as compared to the annual average composition. Colder, more stagnant conditions during the winter are conducive to the formation and buildup of ammonium nitrate. In addition, increased residential wood combustion activity may also occur.

Colusa County APCD

Table I-13 provides information on the yearly variations in the highest PM10 and PM2.5 concentrations recorded across the Colusa County APCD in 2001 through 2003. We estimate that during this period, particulate levels exceeded the State 24-hour PM10 standard of 50 $\mu g/m^3$ at least seven times. Although data are insufficient to determine the calculated days exceeding the State 24-hour PM10 standard in 2002 and 2003, from at least 52 out of the 60 scheduled days with measured PM concentrations in each year, four days in 2002 and five days in 2003 exceeded the standard. In 2001, particulate levels also exceeded the State annual PM10 standard of 20 $\mu g/m^3$. In 2001, PM2.5 levels remained below the State annual PM2.5 standard, however data are insufficient to determine if this was also the case in 2002 and 2003.

Table I-13. PM10 and PM2.5 Air Quality in the Colusa County APCD.

Year	PM10 (ug/m^3)			PM2.5 (ug/m^3)	
	Calculated Days over State Std.	Max 24-hour (Std.=50)	Max Annual Average (Std.=20)	Max 24-hour*	Max Annual Average (Std.=12)
2001	7	76	25	36	10
2002	Incomplete Data	64	Incomplete Data	57	Incomplete Data
2003	Incomplete Data	69	Incomplete Data	30	Incomplete Data

* The maximum 24-hour PM2.5 values are provided for information only.

Table I-14 provides the 24-hour and annual designation values for the State standards for the 2001-2003 period. Designation values represent the highest 24-hour PM10 concentration measured during the three year period, after concentrations measured during highly irregular and infrequent events have been excluded, and the highest estimated PM10 and PM2.5 annual average in the same period. The designation values are determined for each site, and the highest site is used for determining an area's designation. Based on these data, the Colusa County APCD currently is nonattainment for both the State 24-hour and annual average PM10 standards. The District is unclassified for the State annual PM2.5 standard – available data are insufficient to support designation as attainment or nonattainment.

Table I-14. Air District Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Designation Value	76	25	Incomplete Data

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Table I-15 provides designation values for each monitoring site in the air district to provide further information on the geographic distribution of concentrations. Only a single monitor located at Willows is operated in the District. Although data are not complete for all years, annual average PM2.5 concentrations are below the State standard.

Table I-15. Monitoring Site Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

Site	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Colusa	76	25	10

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Figure I-11. Seasonal Variation in PM10 and PM2.5 Concentrations.

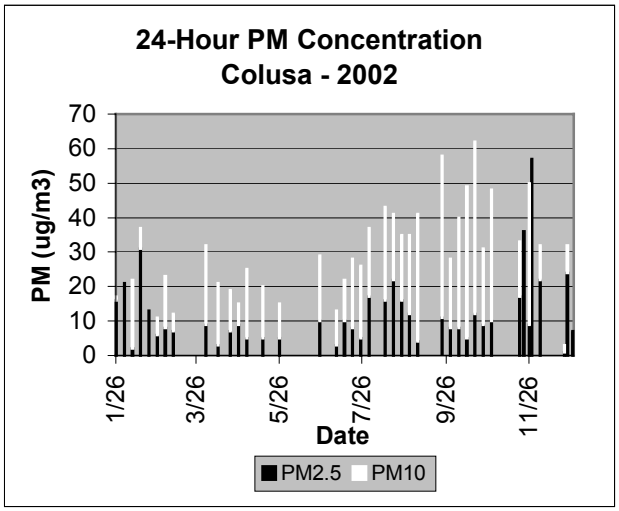


Figure I-11 illustrates the variation in PM10 and PM2.5 levels throughout 2002 at Colusa. The total height of the bars represents PM10 concentrations, while the height of the black portion of the bars represents the PM2.5 fraction. Higher PM10 and PM2.5 concentrations occurred during the fall and winter. The coarse fraction (particles between PM2.5 and PM10 in size) was largest during the early fall. The coarse fraction is primarily due to activities that resuspend dust, such as emissions from paved and unpaved roads and construction.

In contrast, the highest PM2.5 concentrations occur during the late fall and winter. The colder, more stagnant conditions during this time of the year are conducive to the buildup of PM, including the formation of secondary ammonium nitrate. In addition, increased activity from residential wood combustion may also occur. Based on 2000-2003 monitoring data, we estimate the PM2.5 contribution to ambient PM10 to be approximately 45 percent during the fall and 37 percent on an annual average basis. Although no chemical composition data is available, based on information from other sites in the air basin, we estimate that secondary ammonium nitrate and sulfate comprises approximately 30 percent of PM2.5.

Feather River AQMD

Table I-16 summarizes maximum PM10 and PM2.5 concentrations recorded across the Feather River AQMD in 2001 through 2003. We estimate that during this period, particulate levels exceeded the State 24-hour PM10 standard of 50 $\mu g/m^3$ one hundred and six times, and consistently exceeded the State annual PM10 standard of 20 $\mu g/m^3$. In 2001, the annual average PM2.5 concentration was at the level of the State standard of 12 $\mu g/m^3$; in 2003, the annual PM2.5 concentration was below this level; however, data are insufficient to determine if the PM2.5 standard exceeded the standard in 2002.

Table I-16. PM10 and PM2.5 Air Quality in the Feather River AQMD.

Year	PM10 (ug/m^3)			PM2.5 (ug/m^3)	
	Calculated Days over State Std.	Max 24-hour (Std.=50)	Max Annual Average (Std.=20)	Max 24-hour*	Max Annual Average (Std.=12)
2001	50	82	31	56	12
2002	25	75	32	62	Incomplete Data
2003	31	83	27	32	9

* The maximum 24-hour PM2.5 values are provided for information only.

Table I-17 provides the 24-hour and annual designation values for the State standards for the 2001-2003 period. Designation values represent the highest 24-hour PM10 concentration measured during the three year period, after concentrations measured during highly irregular and infrequent events have been excluded, and the highest estimated PM10 and PM2.5 annual average in the same period. The designation values are determined for each site, and the highest site is used for determining an area's designation. Based on these data, the Feather River AQMD currently is nonattainment for both the State 24-hour and annual average PM10 standards. The District is unclassified for the State annual PM2.5 standard – available data are insufficient to support designation as attainment or nonattainment.

Table I-17. Air District Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Designation Value	83	32	Incomplete Data

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Table I-18 provides designation values for each monitoring site in the air district to provide further information on the geographic distribution of concentrations. Only a single monitor located at Yuba City is operated in the District. Although data are not complete for all years, annual average PM2.5 concentrations are at or below the State annual standard.

Table I-18. Monitoring Site Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

Site	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Yuba City	83	32	12

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Figure I-12. Seasonal Variation in PM10 and PM2.5 Concentrations.

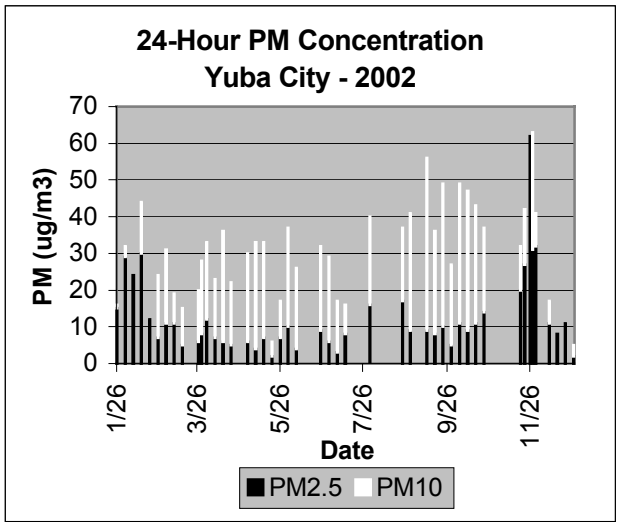


Figure I-12 illustrates the variation in PM10 and PM2.5 levels throughout 2002 at Yuba City. The total height of the bars represents PM10 concentrations, while the height of the black portion of the bars represents the PM2.5 fraction. Higher PM10 concentrations occurred during the late summer, fall, and winter. The coarse fraction (particles between PM2.5 and PM10 in size) was largest during the summer and early fall. The coarse fraction is primarily due to activities that resuspend dust, such as emissions from paved and unpaved roads and construction.

In contrast, the highest PM2.5 concentrations occur during the late fall and winter. The colder more stagnant conditions during this time of the year are conducive to the buildup of PM, including the formation of secondary ammonium nitrate. In addition, increased activity from residential wood combustion may also occur. Based on 2000-2003 monitoring data, we estimate PM2.5 contributes approximately 52 percent to PM10 ambient levels during the fall, 63 percent during the winter, and 40 percent on an annual average basis. Although no chemical composition data is available, based on information from other sites in the air basin, we estimate that secondary ammonium nitrate and sulfate comprises approximately 30 percent of PM2.5.

Placer County APCD

Table I-19 provides information on the yearly variations in the highest PM10 and PM2.5 concentrations recorded across the Placer County APCD portion of the air basin in 2001 through 2003. We estimate that during this period, particulate levels exceeded the State 24-hour PM10 standard of 50 $\mu g/m^3$ thirty-six times, and consistently exceeded the State annual standard of 20 $\mu g/m^3$. In 2002, particulate levels also exceeded the State annual PM2.5 standard of 12 $\mu g/m^3$.

Table I-19. PM10 and PM2.5 Air Quality in the Placer County APCD.

Year	PM10 (ug/m^3)			PM2.5 (ug/m^3)	
	Calculated Days over State Std.	Max 24-hour (Std.=50)	Max Annual Average (Std.=20)	Max 24-hour*	Max Annual Average (Std.=12)
2001	24	62	25	49	12
2002	6	61	25	53	13
2003	6	59	21	30	10

* The maximum 24-hour PM2.5 values are provided for information only.

Table I-20 provides the 24-hour and annual designation values for the State standards for the 2001-2003 period. Designation values represent the highest 24-hour PM10 concentration measured during the three year period, after concentrations measured during highly irregular and infrequent events have been excluded, and the highest estimated PM10 and PM2.5 annual average in the same period. The designation values are determined for each site, and the highest site is used for determining an area's designation. Based on these data, the Placer County APCD portion of the air basin currently is nonattainment for both the State 24-hour and annual average PM10 standards. The District is also nonattainment for the State annual PM2.5 standard.

Table I-20. Air District Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Designation Value	62	25	13

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Table I-21 provides designation values for each monitoring site in the air district to provide further information on the geographic distribution of concentrations. Although data are not complete at the Rocklin monitor, the Roseville monitoring exceeds both the State 24-hour and annual PM10 standards, as well as the State annual PM2.5 standard.

Table I-21. Monitoring Site Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

Site	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Rocklin	Incomplete Data	Incomplete Data	No Monitor
Roseville	62	25	13

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Figure I-13. Seasonal Variation in PM10 and PM2.5 Concentrations.

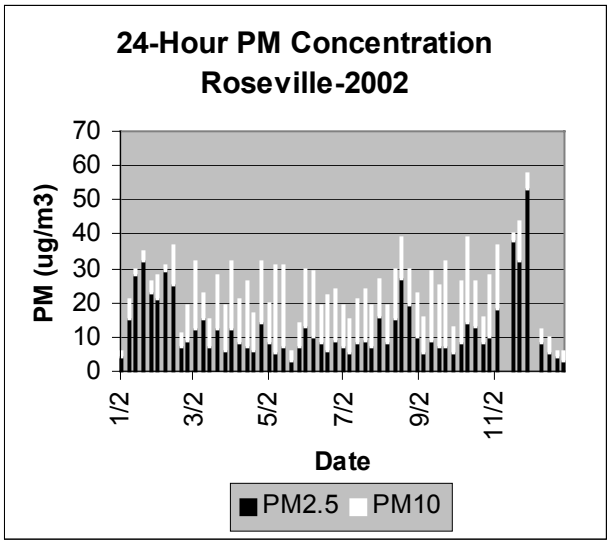


Figure I-13 illustrates the variation in PM10 and PM2.5 levels throughout 2002 at Roseville. The total height of the bars represents PM10 concentrations, while the height of the black portion of the bars represents the PM2.5 fraction. Higher PM10 and PM2.5 concentrations occurred during the winter. The colder, more stagnant conditions during this time of the year are conducive to the buildup of PM2.5, including the formation of secondary ammonium nitrate. In addition, increased activity from residential wood combustion may also occur. Wildfires may have contributed to a peak in PM2.5 concentrations in August of 2002.

Based on 2000-2003 monitoring data, we estimate the PM2.5 contribution to PM10 at Roseville to be approximately 65 percent during the fall and winter and approximately 50 percent on an annual average basis. Although no chemical composition data is available, based on information from other sites in the air basin, we estimate that secondary ammonium nitrate and sulfate comprises approximately 30 percent of PM2.5.

Yolo-Solano AQMD

Table I-22 provides information on the yearly variations in the highest PM10 and PM2.5 concentrations recorded across the Yolo-Solano AQMD in 2001 through 2003. We estimate that during this period, particulate levels exceeded the State 24-hour PM10 standard of 50 $\mu g/m^3$ seventy-nine times, and also exceeded the State annual standard of 20 $\mu g/m^3$. In 2003, annual PM2.5 levels remained below the State annual PM2.5 standard of 12 $\mu g/m^3$, however PM2.5 data are insufficient to determine if the standard was exceeded in the other two years.

Table I-22. PM10 and PM2.5 Air Quality in the Yolo-Solano AQMD.

Year	PM10 (ug/m^3)			PM2.5 (ug/m^3)	
	Calculated Days over State Std.	Max 24-hour (Std.=50)	Max Annual Average (Std.=20)	Max 24-hour*	Max Annual Average (Std.=12)
2001	30	101**	28	57	Incomplete Data
2002	37	87	28	69	Incomplete Data
2003	12	70	16	42	8

* The maximum 24-hour PM2.5 values are provided for information only.
** This value is excluded for determining attainment status. See text.

Table I-23 provides the 24-hour and annual designation values for the State standards for the 2001-2003 period. Designation values represent the highest 24-hour PM10 concentration measured during the three year period, after concentrations measured during highly irregular and infrequent events have been excluded, and the highest estimated PM10 and PM2.5 annual average in the same period. For example, the maximum 24-hour PM10 concentration in 2001 shown in Table I-22 was identified as an extreme concentration event and was excluded in determining the designation values shown in Table I-23. The designation values are determined for each site, and the highest site is used for determining an area's designation. Based on these data, the Yolo-Solano AQMD currently is nonattainment for both the State 24-hour and annual average PM10 standards. The District is unclassified for the State annual PM2.5 standard – available data are insufficient to support designation as attainment or nonattainment.

Table I-23. Air District Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Designation Value	87	28	Incomplete Data

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Table I-24 provides designation values for each monitoring site in the air district to provide further information on the geographic distribution of concentrations. The data show that all three PM10 monitors exceeded the State 24-hour and annual PM10 standards, with highest concentrations at West Sacramento. Although the data are not complete for all years and all sites, PM2.5 annual average concentrations at Woodland were below the State annual PM2.5 standard.

Table I-24. Monitoring Site Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

Site	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Davis	No Monitor	No Monitor	Incomplete Data
Vacaville	74	21	No Monitor
West Sacramento	87	28	No Monitor
Woodland	86	27	8

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.

Figure I-14. Seasonal Variation in PM10 and PM2.5 Concentrations.

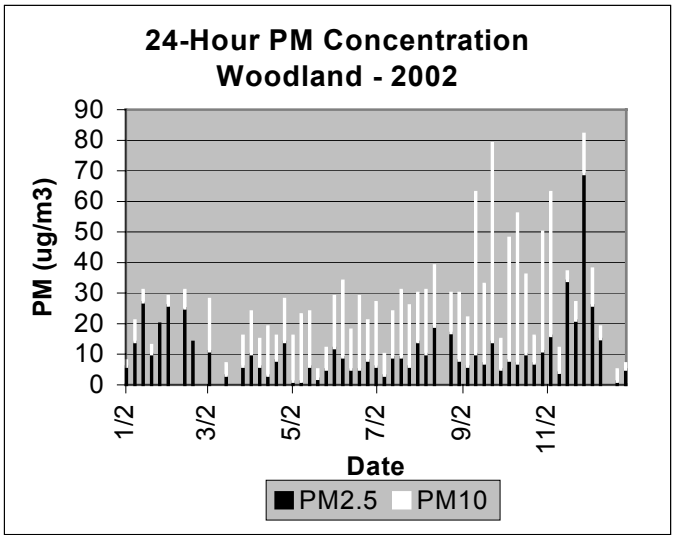


Figure I-15. Seasonal Variation in PM2.5 Concentrations.

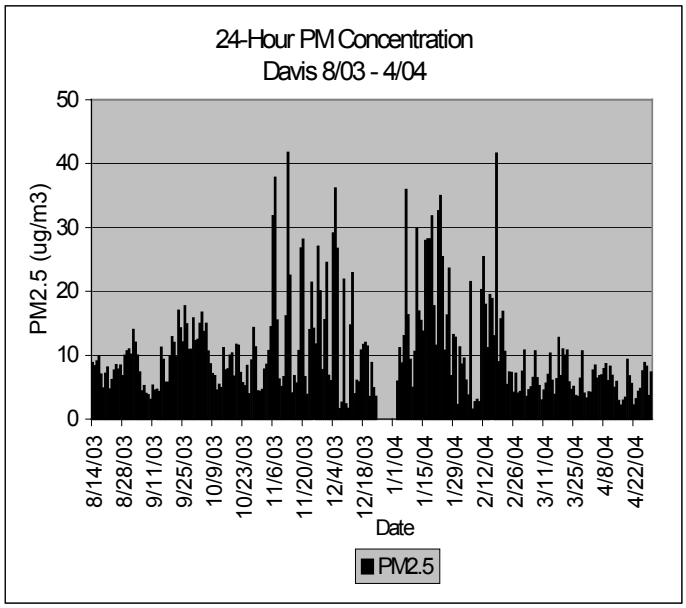


Figure I-14 illustrates the variation in PM10 and PM2.5 levels throughout 2002 at Woodland, while Figure I-15 illustrates the variation in PM2.5 levels from August 2003 through April 2004 at Davis. The total height of the bars represents PM10 concentrations, while the height of the black portion of the bars represents the PM2.5 fraction. At Woodland, the highest PM10 concentrations occurred during the fall and winter. The coarse fraction (particles between PM2.5 and PM10 in size) was largest during the early fall. The coarse fraction is primarily due to activities that resuspend dust, such as emissions from paved and unpaved roads and construction.

In contrast, the highest PM2.5 concentrations at Woodland and Davis occurred in the late fall and winter. The colder, more stagnant conditions during this time of the year are conducive to the buildup of PM2.5, including the formation of secondary ammonium nitrate. In addition, increased activity from residential wood combustion may also occur.

Based on 2000-2003 monitoring data, we estimate the PM2.5 contribution to ambient PM10 at Woodland to be approximately 80 percent during December and January, and approximately 40 percent on an annual average basis.

Figure I-16. Hourly Variation in PM2.5 Concentrations.

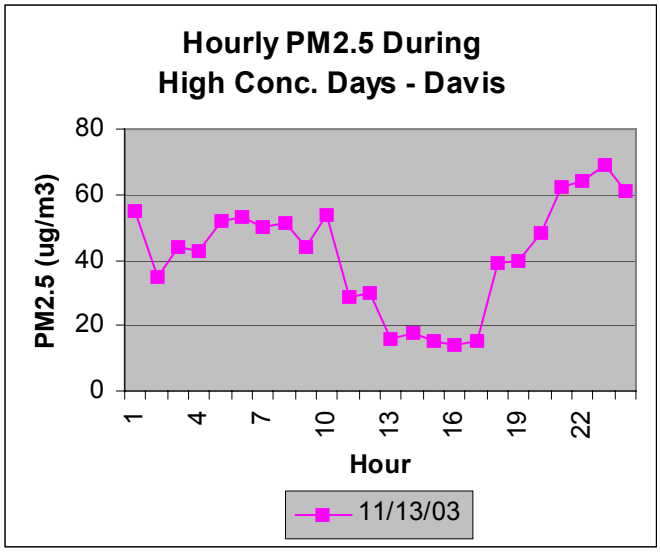


Figure I-16 presents the hourly variation for the day with the highest PM2.5 concentration at Davis. PM2.5 concentrations were highest during the night through mid-morning, from 12 a.m. to 10 a.m. and again from 6 p.m. to 11 p.m. Peak evening concentrations generally reflect the influence of lowering inversion heights which trap pollutant close to the surface, as well as increased activity from evening commute traffic and residential wood combustion during winter months.

Although no chemical composition data is available, based on information from other sites in the air basin, we estimate that secondary ammonium nitrate and sulfate comprises approximately 30 percent of PM2.5.

Sacramento Metro AQMD

Table I-25 provides information on the yearly variations in the highest PM10 and PM2.5 concentrations recorded across the Sacramento Metro AQMD in 2001 through 2003. During this period, PM10 levels exceeded the State 24-hour standard of 50 $\mu g/m^3$ an estimated fifty-five times, and consistently exceeded the State annual PM10 standard of 20 $\mu g/m^3$.

Table I-25. PM10 and PM2.5 Air Quality in the Sacramento Metro AQMD.

Year	PM10 (ug/m^3)			PM2.5 (ug/m^3)	
	Calculated Days over State Std.	Max 24-hour (Std.=50)	Max Annual Average (Std.=20)	Max 24-hour*	Max Annual Average (Std.=12)
2001	Incomplete Data	96	Incomplete Data	128	Incomplete Data
2002	30	91	28	91	Incomplete Data
2003	25	77	29	73	12

* The maximum 24-hour PM2.5 values are provided for information only.

Table I-26 provides the 24-hour and annual designation values for the State standards for the 2001-2003 period. Designation values represent the highest 24-hour PM10 concentration measured during the three year period, after concentrations measured during highly irregular and infrequent events have been excluded, and the highest estimated PM10 and PM2.5 annual average in the same period. The designation values are determined for each site, and the highest site is used for determining an area's designation. Based on these data, the Sacramento Metro AQMD currently is nonattainment for both the State 24-hour and annual average PM10 standards. The District is also nonattainment for the State annual PM2.5 standard.

Table I-26. Air District Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Designation Value	96	29	13**

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.
** Based on data substitution.

Table I-27 provides designation values for each monitoring site in the air district to provide further information on the geographic distribution of concentrations. Particulate levels exceeded both State PM10 standards consistently across the air district. Highest 24-hour PM10 concentrations occurred at the Sacrament-Health Department and Sacramento-T Street monitoring sites, while highest annual average PM10 concentrations were found at Sacramento-Branch Center and Sacramento-T Street. Although the PM2.5 data were incomplete, we estimated through data substitution procedures at the Sacramento-T Street monitor that this air district exceeds the State annual PM2.5 standard.

Table I-27. Monitoring Site Level Designation Values* for the State PM10 and PM2.5 Standards (2001-2003 Period).

Site	PM10 (ug/m^3)		PM2.5 (ug/m^3)
	24-Hour (Std.=50)	Annual Average (Std.=20)	Annual Average (Std.=12)
Elk Grove	No Monitor	No Monitor	Incomplete Data
Folsom	No Monitor	No Monitor	Incomplete Data
North Highlands	68	Incomplete Data	No Monitor
Sacramento-Branch Center Rd.	82	29	No Monitor
Sacramento-Del Paso Manor	72	26	12
Sacramento-Health Dept.	90	22	Incomplete Data
Sacramento-T St.	96	28	13**
Sacramento-Airport	73	26	No Monitor

* Designation value is the value used for determining attainment status. It is the highest measured value over three years after excluding highly irregular or infrequent events.
** Based on data substitution.

Figure I-17 illustrates variation in PM10 and PM2.5 levels throughout 2002 at Sacramento-Del Paso (a) and Sacramento-T Street (b). The total height of the bars represents PM10 concentrations, while the height of the black portion of the bars represents the PM2.5 fraction. At both sites, the highest PM10 and PM2.5 concentrations occurred during the winter. The colder, more stagnant conditions during this time of the year are conducive to the buildup of PM2.5, including the formation of secondary ammonium nitrate. In addition, increased activity from residential wood combustion may also occur. Based on 2000-2003 monitoring data, we estimate PM2.5 accounts for approximately 65 percent of ambient PM10 during the fall and winter and 55 percent on an annual basis.

Figure I-17. Seasonal Variation in PM10 and PM2.5 Concentrations.

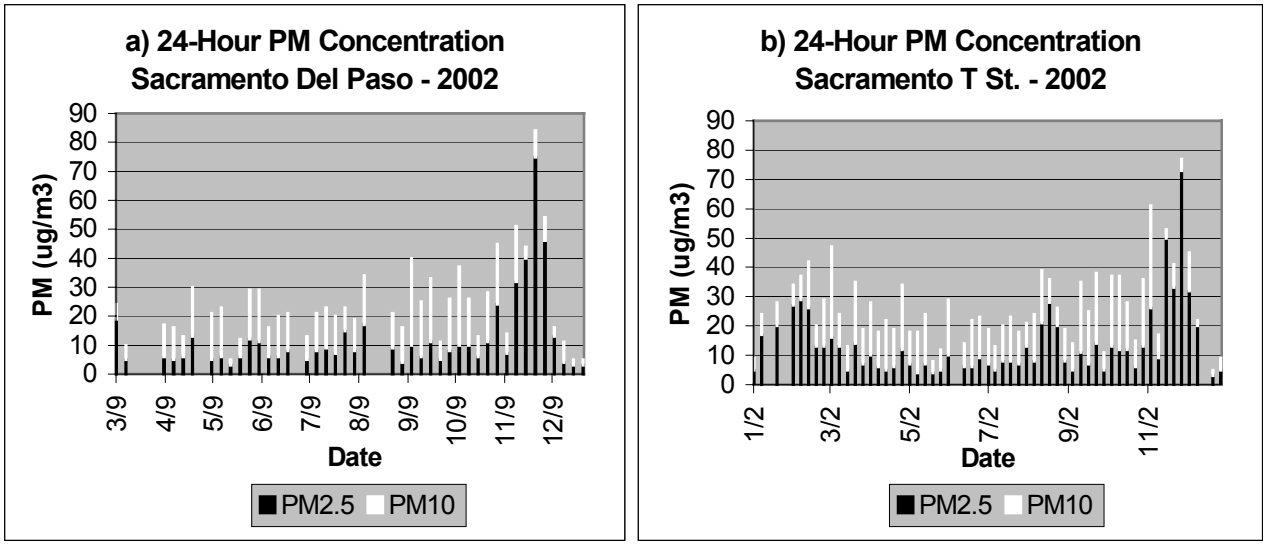


Figure I-18. Hourly Variation in PM2.5 Concentrations.

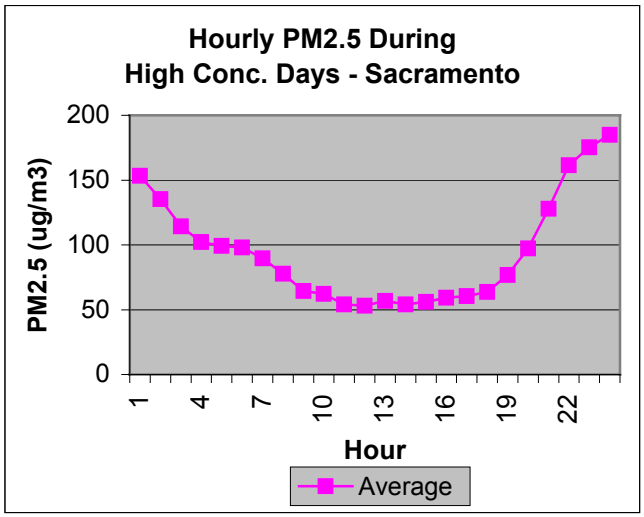
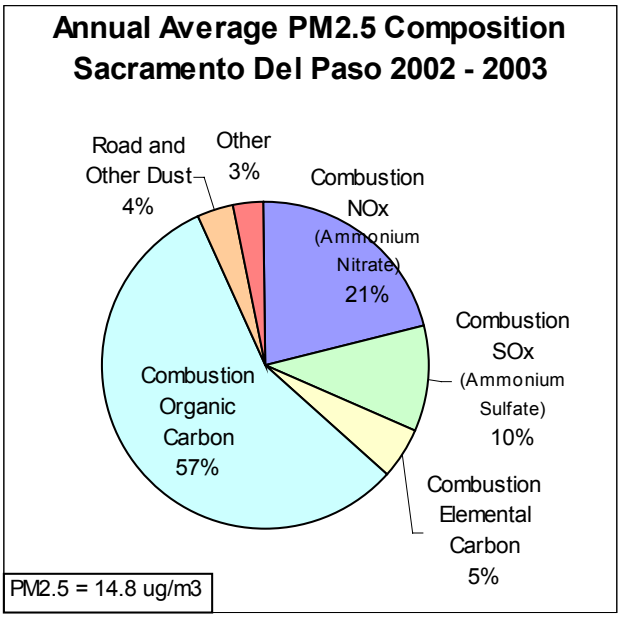


Figure I-18 presents the average hourly variation in PM2.5 levels in Sacramento for the days within the year with the highest PM2.5 concentrations. Concentrations are highest from 7 p.m. through 7 a.m. Peak evening concentrations generally reflect the influence of lowering inversion heights which trap pollutants close to the surface, as well as increased activity from evening commute traffic and residential wood combustion during winter months.

Figure I-19. Chemical Composition of Annual Average PM2.5 and Link to Emission Source Type.

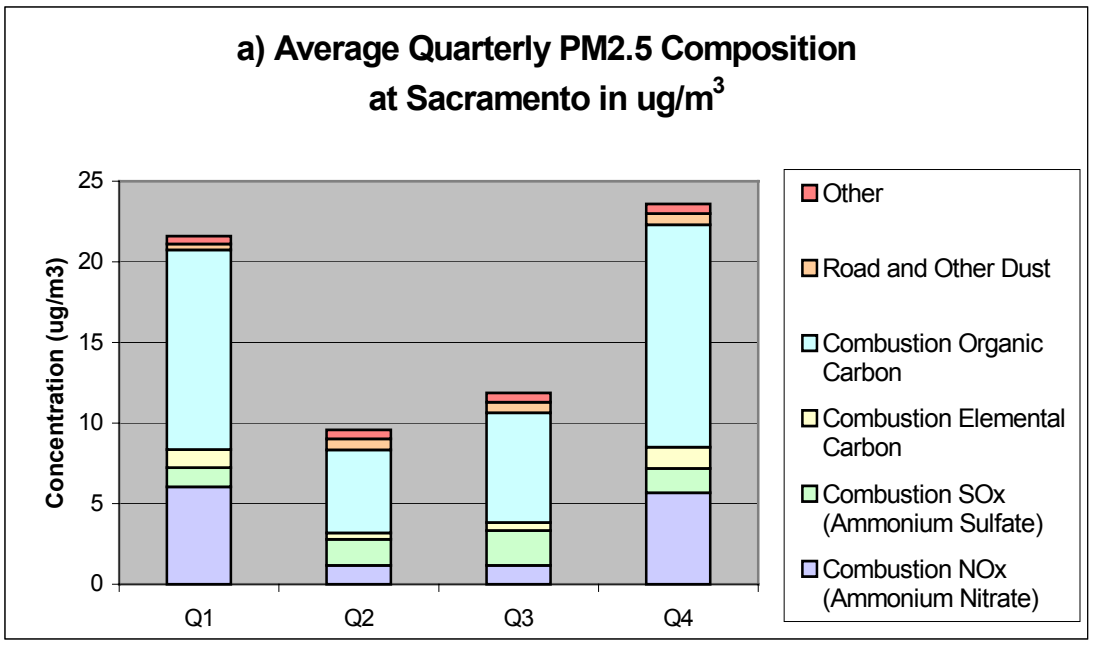


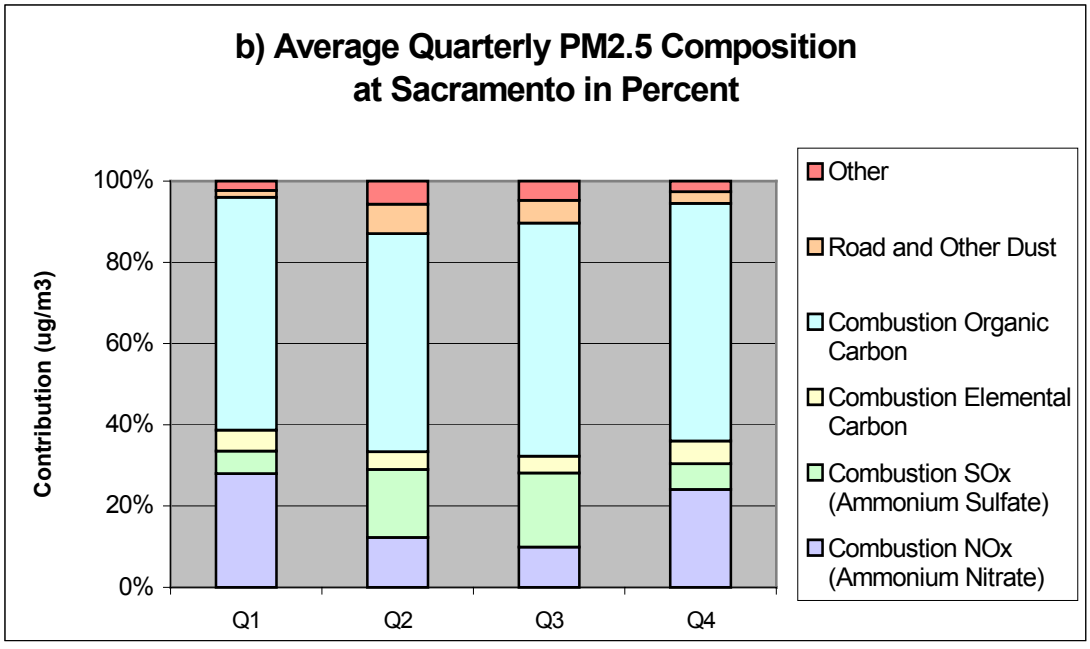
Data for Figure I-19 are from analysis of ambient PM2.5 data collected at Sacramento-Del Paso from the State's PM2.5 speciation network. Chemical components have been associated with possible emission sources based on emission inventory information. On an annual average basis organic carbon is the major contributor to PM2.5 (57 percent). The majority of organic carbon is suspected to be due to directly emitted carbon from combustion sources. Key sources include vehicles, residential wood combustion, agricultural and prescribed burning, and stationary combustion sources. However, a fraction may be due to secondary organic aerosol formation from anthropogenic and biogenic VOC emissions.

Ammonium nitrate and ammonium sulfate - formed in the atmosphere from chemical reactions of NOx and SOx from vehicle exhaust and from stationary source combustion sources - also contribute significantly to ambient PM2.5 (approximately 30 percent). Dust from roads and other dust producing activities, and elemental carbon from combustion processes contribute to a lesser extent.

Figure I-20 illustrates the quarterly variation in PM2.5 levels and in its chemical components expressed in $\mu g/m^3$ (a) and as percent of PM2.5 (b) at Sacramento-Del Paso. As in the previous figures, chemical components have been associated with possible emission sources based on emission inventory information. On average, during the 2002-2003 period, higher PM2.5 concentrations were recorded during the fall and winter. The PM2.5 chemical composition is very similar throughout the year, with organic carbon the principal contributor (approximately 55 percent).

Figure I-20. Chemical Composition of Average Quarterly PM2.5 and Link to Emission Source Type.





During the fall and winter, the ammonium nitrate fraction of PM2.5 is higher than during the spring and summer, while ammonium sulfate and dust contribute slightly more to ambient PM2.5 during the spring and summer. Cool temperatures, low wind speeds, low inversion layers, and high humidity during the late fall and winter favor the formation of ammonium nitrate; while sunny, warmer conditions during the spring and summer favor the formation of ammonium sulfate, as well as the formation of secondary organic aerosols.

The chemical composition of ambient PM can vary substantially on days with high concentrations depending on meteorological conditions and which PM sources are most active. For example, residential wood combustion can increase on holidays and weekends. To highlight these differences, Figure I-21 presents the chemical composition of PM2.5 and associated emission sources for Thanksgiving Day (11/28/02) (a) and a representative January day (b) at Sacramento-Del Paso. Ammonium nitrate contributes significantly more to ambient PM2.5 on the November Day than on the January day. However, on both days, the major contributor is organic carbon.

Figure I-21. Chemical Composition of PM2.5 on High Concentration Days and Link to Emission Source Type.

a) 11/28/02 **b) 1/7/01**

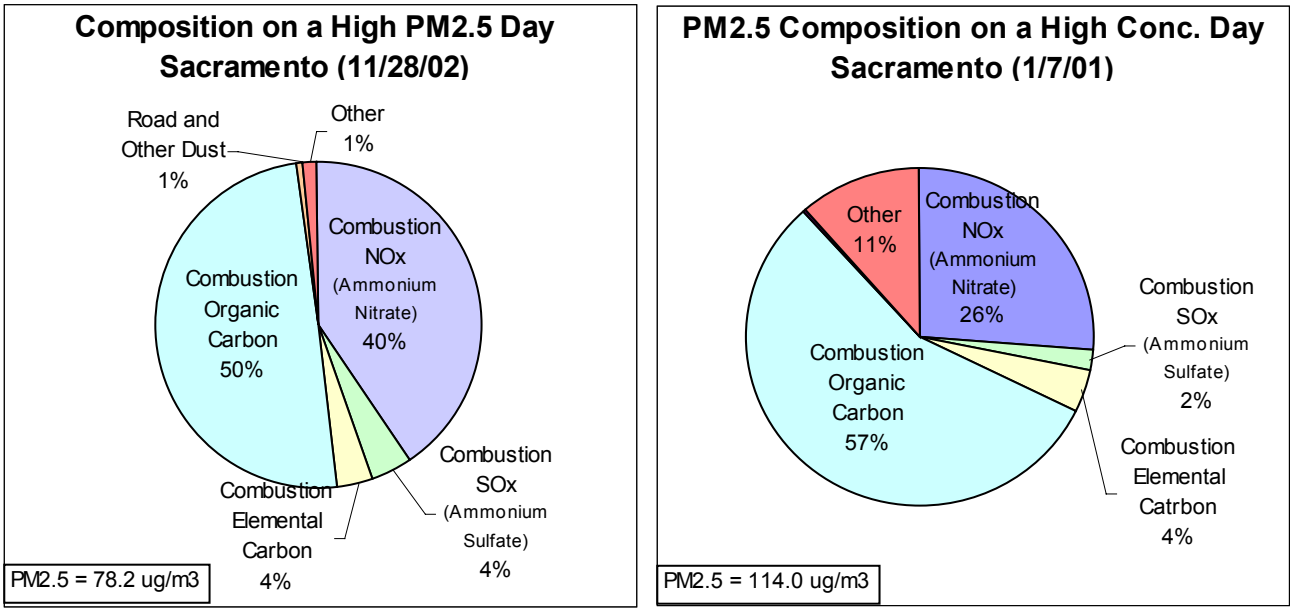
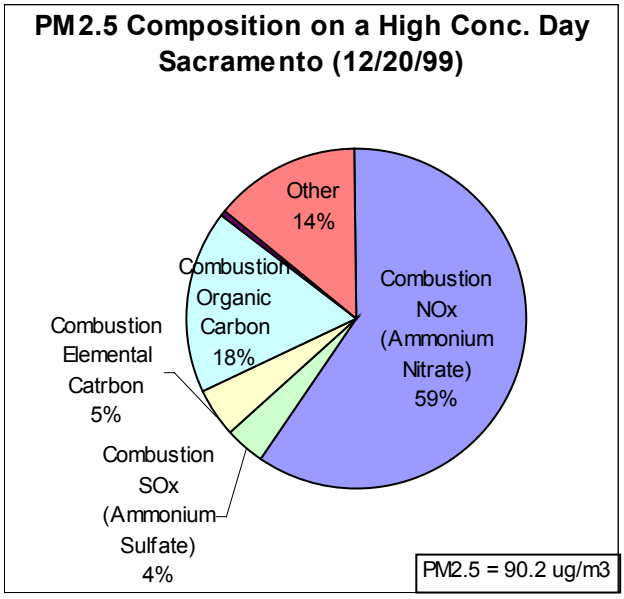


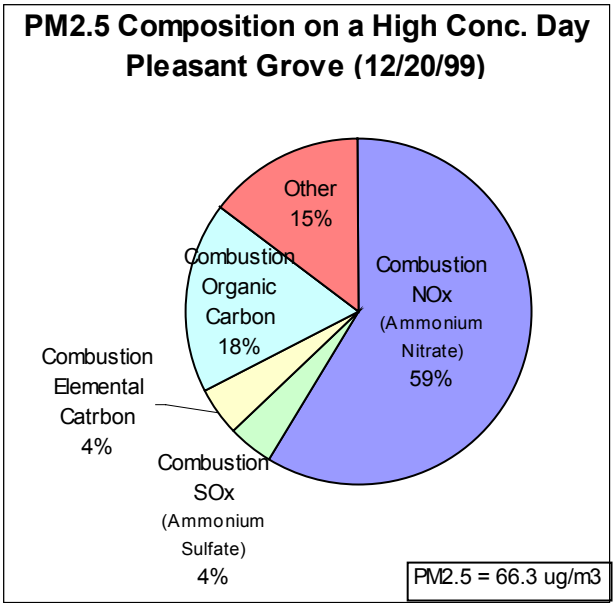
Figure I-22 presents additional chemical composition of PM2.5 and associated emission sources obtained as part of the California Regional PM10 and PM2.5 Air Quality Study on a representative December 1999 day at Sacramento-Del Paso (a) and at Pleasant Grove (b). In contrast to the previously presented days, the major contributor to ambient PM2.5 was ammonium nitrate, followed by organic carbon at both Sacramento and Pleasant Grove. The length of this particular episode was conducive to the long-term buildup and accumulation of ammonium nitrate in the atmosphere.

Figure I-22. Chemical Composition of PM2.5 on a High Concentration Day at Two Different Locations

a) Sacramento



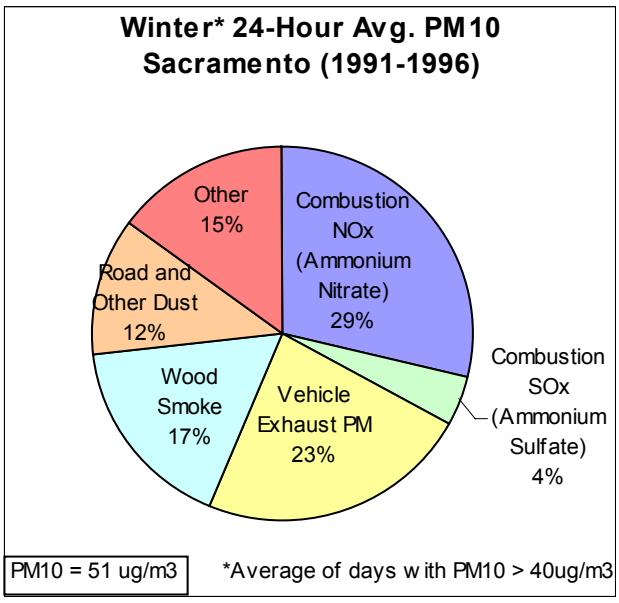
b) Pleasant Grove



Data for Figure I-23 present the results of a chemical mass balance modeling performed using ambient PM data collected throughout the winter (November-January) of 1991-1996 for PM10 (a) and PM2.5 (b) (Motallebi 1999 and 2001). The chemical mass balance modeling provides further resolution on the sources of organic and elemental carbon. During the winter, ammonium nitrate is the largest component of ambient PM. Directly emitted particles from vehicle exhaust, and wood smoke from residential fireplaces are also major contributors. Dust from roads and from other sources contributes to ambient PM10, but not significantly to the PM2.5 fraction.

Figure I-23. Source Apportionment by Chemical Mass Balance Modeling.

a) PM10



b) PM2.5